A numerical study of atmospheric pollutant dispersion over the southern Korean peninsula on sunny summer day

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A Lagrangian dispersion model has been developed to study the transport of atmospheric pollutants over the southern Korean peninsula on sunny summer days. A mesoscale atmospheric model has been employed to provide the wind fields and information for turbulent diffusion for the calculation of trajectories using a conditioned particle technique. The model has been applied to simulate the transport of atmospheric pollutants emitted from five sources in the coastal locations under various synoptic scale winds.

The model results indicate that the particles emitted during daytime are mixed vertically and transported toward inland by sea-breeze under calm synoptic scale condition. The particles then transported upward at the sea-breeze front or by the upward motion over the mountain and show some tendency of returning toward the coast by the return flow of the sea-breeze circulation. Under calm synoptic scale condition, the particles are found to remain over the peninsula throughout the integration period. When there is westerly synoptic scale wind, the particles emitted in the west coast can reach the east coast within a day or faster depending on the speed. The present study indicates that the pollutants emitted from the major sources along the coast can be transported toward inland by the sea-breeze under calm synoptic condition and can cause air pollution problem in the area with no significant sources.